Claims

1. A method of location management in a mobile telecommunication system comprising mobile subscribers and their mobile stations, at least one core network providing telecommunication services and a radio access network providing connections between the mobile stations and the core network, and in which system information concerning the location of the mobile station is stored in the radio access network,

characterized in that

a plurality of location areas and a reporting area comprising at least one location area are defined,

the radio access network tracks the mobile station with an accuracy of one location area, and

the radio access network reports to the core network the changes in location with an accuracy of one reporting area.

2. A method according to claim 1, characterized in that a plurality of location accuracy levels is defined, each location accuracy level having location areas of different sizes, and the radio access network selects one of these accuracy levels to be used for tracking the mobile station.

3. A method according to claim 2, characterized in that the reporting area is a location area of one location accuracy level.

4. A method according to claim 2, characterized in that the radio access network selects the location accuracy level based on the services the mobile subscriber is currently using.

5. A method according to claim 2, characterized in that the radio access network selects the location accuracy level based on service parameters given by the core network.

6. A method according to claim 2, characterized in that the radio access network selects the location accuracy level based on the past behavior of the mobile subscriber.

7. A method according to claim 6, characterized in that the behavior of the mobile subscriber is determined based on the number of pages the radio access network has performed to locate the mobile station and the number of location updates the mobile station has performed.

8. A method according to claim 2, characterized in that the radio access network informs the mobile station of the location accuracy level to be used when tracking the mobile station.

9. A method according to claim 1, characterized in that the core network requests that a mobile station reauthenticates itself when the mobile phone moves to a new reporting area.

10. A method according to claim 1, characterized in that the mobile station is entitled to different services in different reporting areas.

11. A method according to claim 1, characterized in that the mobile station is entitled to different qualities of service in different reporting areas.

12. A method according to claim 1, characterized in that the core network and the radio access network negotiate the size of the reporting area to be used.

13. A method according to claim 12, characterized in that the negotiation takes place when the service is activated.

14. A method according to claim 12, characterized in that the negotiation takes place when the service is in an activated state.

15. A method according to claim 1, characterized in that

the service parameters for different service areas for the services the mobile subscriber has subscribed to are specified and stored in the core network,

the mobile station of the subscriber initiates a location update procedure when entering into a new reporting area,

in response to having received the location update message, the radio access network forwards the new location information of the mobile station to the core network,

the core network receives the new location information and defines the new service area of the subscriber, checks the service parameters of services the mobile subscriber is entitled to in the new service area, and sends the radio access network information about the new service parameters,

the radio access network receives the information about the new service parameters and completes the location update procedure by sending the mobile station an answer.

16. A method according to claim 1, characterized in that

information about service area configuration is stored in the mobile station, and when entering a new service area, the mobile station initiates a location update procedure, instructing the radio access network to

forward the new location information to the core network, and

the radio access network forwards the location information to the core network.

17. A method according to claim 16, characterized in that the information about the service area configuration is given as a list of cells.

18. A method according to claim 16, characterized in that the information about the service area configuration is given as coordinates of the service area and the mobile station observes its coordinates and initiates a location update when entering into a new service area.

19. A network element for a radio access network in a mobile telecommunication system comprising mobile subscribers and their mobile stations, at least one core network providing telecommunication services and a radio access network providing connections between the mobile stations and the core network, and in which system information concerning the location of the mobile station is stored in the radio access network,

characterized in that the network element is adapted to

store information concerning a plurality of location areas and a reporting area comprising at least one location area,

tracking the mobile station with an accuracy of one location area, and

reporting to the core network the changes in location with an accuracy of one reporting area.

20. A network element as defined in claim 19, characterized in that the network element is in addition adapted to negotiate the size of the reporting area with the core network.

21. A radio access network for a mobile telecommunication system comprising mobile subscribers and their mobile stations, at least one core network providing telecommunication services, and a radio access network providing connections between the mobile stations and the core network, and in which system information concerning the location of the mobile station is stored in the radio access network,

characterized in that the radio access network is adapted to

store information concerning a plurality of location areas and a reporting area comprising at least one location area,

tracking the mobile station with an accuracy of one location area, and

reporting to the core network the changes in location with an accuracy of one reporting area.

22. A radio access network as defined in claim 21, c h a r a c t e r i z e d in that the radio access network is in addition adapted to negotiate the size of the reporting area with the core network.

23. A radio access network for a mobile telecommunication system comprising mobile subscribers and their mobile stations, at least one core network providing telecommunication services, and a radio access network providing connections between the mobile stations and the core network, and in which system information concerning the location of the mobile station is stored in the radio access network on the accuracy of one location area and in the core network on the accuracy of one service area,

c h a r a c t e r i z e d in that the core network is adapted to

receive messages reporting the changes in the location of a mobile station with an accuracy of one reporting area and

to define the current service area of the mobile station based on the reported location.

24. A core network as defined in claim 23, c h a r a c t e r i z e d in that the network element is in addition adapted to negotiate the size of the reporting area with the radio access network.

25. A mobile station for a mobile telecommunication system comprising mobile subscribers and their mobile stations, at least one core network providing telecommunication services and a radio access network providing connections between the mobile stations and the core network, and in which system information concerning the location of the mobile station is stored in the radio access network as to the accuracy of one location area and in the core network as to the accuracy of one service area,

c h a r a c t e r i z e d in that the mobile station is adapted to

store information about the service areas of the subscriber, and when entering a new service area, to

initiate a location update procedure and to instruct the radio access network to forward the new location information to the core network.

Claims

26 A method of location management in a mobile telecommunication system comprising mobile subscribers, mobile stations, at least one core network providing telecommunication services, and a radio access network providing connections between the mobile stations and the core network, and in which system information concerning a location of a mobile station is stored in the radio access system, characterized in that

the radio access system uses a location area configuration to track the location of the mobile station on the accuracy of one location area,

determining in the core network a service area comprising at least one location area,

informing the radio access network of the service area determined,

receiving by the radio access network a location update from a mobile station,

determining based on the location update whether or not the mobile station has exceeded the border of the service area, and

sending the core network a report if the mobile station has exceeded the border.

27 A method according to claim 26, wherein a plurality of location accuracy levels is defined, each location accuracy level having location areas of different sizes, and the radio access network selects one of these accuracy levels to be used for tracking the mobile station.

28 A method according to claim 27 wherein the reporting area is a location area of one location accuracy level.

29. A method according to claim 27 wherein the radio access network selects the location accuracy level based on the services the mobile subscriber is currently using.

30 A method according to claim 27 wherein the radio access network selects the location accuracy level based on service parameters given by the core network.

31 A method according to claim 27 wherein the radio access network selects the location accuracy level based on the past behavior of the mobile subscriber.

32 A method according to claim 31 wherein the behavior of the mobile subscriber is determined based on the number of pages that the radio ac-

cess network has performed to locate the mobile station and the number of location updates that the mobile station has performed.

33. A method according to claim 27, wherein the radio access network informs the mobile station of the location accuracy level to be used when tracking the mobile station.

34. A method according to claim 26, wherein the core network requests that a mobile station reauthenticates itself when the mobile phone moves to a new reporting area.

35. A method according to claim 26, wherein the mobile station is entitled to different services in different reporting areas.

36. A method according to claim 26, wherein the mobile station is entitled to different qualities of service in different reporting areas.

37. A method according to claim 26, wherein the core network and the radio access network negotiate the size of the reporting area to be used.

38. A method according to claim 37, wherein the negotiation takes place when the service is activated.

39. A method according to claim 37, wherein the negotiation takes place when the service is in an activated state.

40. A method according to claim 26, wherein

the service parameters for different service areas for the services the mobile subscriber has subscribed to are specified and stored in the core network,

the mobile station of the subscriber initiates a location update procedure when entering into a new reporting area,

in response to having received the location update message, the radio access network forwards the new location information of the mobile station to the core network,

the core network receives the new location information and defines the new service area of the subscriber, checks the service parameters of services the mobile subscriber is entitled to in the new service area, and sends the radio access network information about the new service parameters,

the radio access network receives the information about the new service parameters and completes the location update procedure by sending the mobile station an answer.

41. A method according to claim 26, wherein

information about service area configuration is stored in the mobile station, and when entering a new service area, the mobile station initiates a location update procedure, instructing the radio access network to forward the new location information to the core network, and

the radio access network forwards the location information to the core network.

42 A method according to claim 41, wherein the information about the service area configuration is given as a list of cells.

43 A method according to claim 41, wherein the information about the service area configuration is given as coordinates of the service area and the mobile station observes its coordinates and initiates a location update when entering into a new service area.

44 A radio access network for a mobile telecommunication system comprising mobile subscribers, mobile stations, at least one core network providing telecommunication services, and a radio access network providing connections between the mobile stations and the core network, and in which system information concerning the location of the mobile station is stored in the radio access system, characterized in that the radio access system is adapted to

use a location area configuration to track the location of the mobile station on the accuracy of one location area,

receive information on a service area determined,

receive a location update from a mobile station,

determine, based on the location update, whether or not the mobile station has exceeded the border of the service area, and

send the core network a report if the mobile station has exceeded the border.

45 A network element for a radio access network of a mobile telecommunication system comprising mobile subscribers, mobile stations, at least one core network providing telecommunication services, and a radio access network providing connections between the mobile stations and the core network, and in which system information concerning the location of the mobile station is stored in the radio access system,

characterized in that the network element is adapted to

use a location area configuration to track the location of the mobile station on the accuracy of one location area,

receive information on a service area determined,

receive a location update from a mobile station,

determine, based on the location update, whether or not the mobile station has exceeded the border of the service area, and

send the core network a report if the mobile station has exceeded the border.

~~16~~ A core network for a mobile telecommunication system comprising mobile subscribers, their mobile stations, at least one core network providing telecommunication services, and a radio access network providing connections between the mobile stations and the core network, and in which system information concerning the location of the mobile station is stored in the radio access system, and the radio access system uses a location area configuration to track the location of the mobile station on the accuracy of one location area,

characterized in that the core network is adapted to

determine a service area comprising at least one location area,

inform the radio access network of the service area determined, to

receive a report from the radio access system when the mobile station has exceeded the border of the reporting area.

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